

CLAIMS

1. An optoelectronic filter device, comprising:

first means that define a first resonant cavity having a thickness and a composition that are chosen so as to exhibit a multiplicity of resonant transmission modes over a chosen wavelength range;

second means that define a second resonant cavity having a thickness and a composition that are chosen so as to exhibit a single resonant transmission mode over said chosen range,

means for optically coupling said first and second means; and

electrostatic means designed to apply an electrical voltage to said second means, said electrical voltage being chosen so as to vary the thickness of the second cavity and the spectral position of the associated resonant mode so that it coincides with any one of the resonant modes of the first cavity in order to produce a filter having two optically coupled resonant cavities.

2. The device as claimed in claim 1, wherein the thickness and the composition of the first cavity are chosen so that said multiplicity of resonant transmission modes defines a comb of chosen intermode spacing.

3. The device as claimed in claim 1, wherein at least some of the first and second means are composed of semiconductor materials.

4. The device as claimed in claim 1, wherein the first means comprises two approximately parallel partial

reflectors spaced apart by a first layer of material having a thickness that defines the position of the resonant modes of the first cavity and ensures the resonance of this first cavity.

5. The device as claimed in claim 4, wherein said first layer of material is a layer of semiconductor material having two approximately parallel faces bonded to said partial reflectors respectively.

6. The device as claimed claim 1, wherein the second means comprises at least two approximately parallel partial reflectors spaced apart by a second layer of material having a thickness that defines the position of the resonant mode of the second cavity and ensures the resonance of this second cavity.

7. The device as claimed in claim 6, wherein said second layer of material is a layer of air, the partial reflectors being spaced apart by spacers.

8. The device as claimed in claim 4, wherein said partial reflectors are Bragg reflectors consisting of quarter-wave-type alternations of two materials having different refractive indices.

9. The device as claimed in claim 8, wherein at least some of said Bragg reflectors consist of alternations of silicon layers and silicon oxide layers.

10. The device as claimed in claim 8, wherein at least some of said Bragg reflectors consist of at least one alternation of air layers and semiconductor layers, said semiconductor layers being separated from one another by semiconductors spacers.

11. The device as claimed in claim 1, wherein the optical coupling means comprises third means interposed between the first and second means and having dimensions chosen so as to ensure optical coupling between said first and second cavities.

12. The device as claimed in claim 11, wherein said third means comprises a layer of material placed between two reflectors belonging to the first means and to the second means respectively.

13. The device as claimed in claim 12, wherein said third means comprises a layer of air placed between two reflectors belonging to the first means and to the second means respectively, said reflectors being spaced apart by spacers.

14. The device as claimed in claim 4, wherein said electrostatic means comprises a first electrode and a second electrode, each in contact with a partial reflector of the first means and suitable for being placed at different potentials chosen so as to vary the thickness of the air cavity located between said partial reflectors.

15. The device as claimed in claim 14, wherein the second means defines at least one substructure of the pin or nip junction type, reverse-biased or forward-biased by said first and second electrodes respectively, one of the reflectors including semiconductor layers having an n-type doping, the other reflector including semiconductor layers having a p-type doping, and the spacers that define the second cavity being unintentionally i-type doped.

16. The device as claimed in claim 1, further comprising means for frequency-shifting the multiplicity of resonant transmission modes of the first means.

17. The device as claimed in claim 16, wherein the frequency shift means is designed to vary the temperature of at least said first means in a controlled manner.

18. The device as claimed in claim 3, wherein the semiconductor layers are made from III-V type materials, particularly gallium arsenide (GaAs) or indium phosphide (InP), and wherein the spacers are made from III-V type materials, particularly InGaAs.

19. The device as claimed in claim 3, wherein said semiconductor layers and said spacers are produced by epitaxy and selective etching techniques.